Siliconated Pyrolytic Graphite : Part 4. Electrical Resistivity

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Abstract

Investigations have been made on the electrical resistivity ρ of siliconated pyrolytic graphite (PG(Si), 0.02 to 4 wt% silicon) prepared by pyrolysis of a mixture of propane gas and silicon tetrachloride vapour at various deposition temperatures, total gas pressures, and partial pressures of silicon tetrachloride vapour. With increase in the partial pressure of silicon tetrachloride, ρ_a decreases and ρ_c increases. The electrical anisotropy (ρ_c/ρ_a) of PG(Si) is two orders of magnitude higher than that of PG, at deposition temperatures between 1600 and 1700°C and a total gas pressure of 50 torr. Effects of the silicon content, density and structural features on the resistivities and the anisotropy have been discussed. The anisotropy is closely related to the preferred orientation, and high values of ρ_c/ρ_a induced by discontinuity in the stacking of crystallites are lowered in silicon-rich PG(Si) by the presence of SiC between the crystallites.

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